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NASA-13215 (December 2003)
NATIONAL AERONAUTICS
NASA
AND SPACE ADMINISTRATION
Superseding NASA-13215
(October 2003)

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DIVISION 13 - SPECIAL CONSTRUCTION

SECTION 13215

FIBERGLASS-REINFORCED POLYESTER STORAGE TANK

12/03

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SECTION 13215

FIBERGLASS-REINFORCED POLYESTER STORAGE TANK
12/03

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NOTE: Delete, revise, or add to the text in this section to cover project requirements. Notes are for designer information and will not appear in the final project specification.

This section covers fiberglass-reinforced polyester storage tanks and accessories for use in aggressive chemical service at atmospheric pressures and is limited to flat-bottomed, aboveground, vertical, cylindrical tanks.

This section does not cover vertical tanks with dished or conical bottoms, vertical tanks for buried service, pressure vessels, and horizontal tanks for both above ground and buried services.

Related work specified elsewhere includes:

Cast-in-place concrete

Anchor bolts (provide calculations that determined bolt sizes and quantities required.)

Plastic pipe

Acid-resistant pipe

Chemical valves

Liquid level gages

Drawings should show:

The physical location of each tank

Details showing the location of all accessories to be furnished with each tank

Concrete-foundation details for each tank

Details for anchoring each tank to the foundation

A schedule with connections, size, quantity, and location of tanks. Specify connection usage such as drain, vent, or overflow and location by top or side. This schedule should be coordinated with accessory locations shown on drawings.

****

PART 1 GENERAL

1.1 REFERENCES

****

NOTE: The following references should not be manually edited except to add new references. References not used in the text will automatically be deleted from this section of the project specification.

****

The publications listed below form a part of this section to the extent referenced:

ASME INTERNATIONAL (ASME)

ASME B16.5	(1996) Pipe Flanges and Flanged Fittings NPS 1/2 Through NPS 24

ASTM INTERNATIONAL (ASTM)

ASTM C 581	(1994) Standard Practice for Determining Chemical Resistance of Thermosetting Resins Used in Glass Fiber Reinforced Structures, Intended for Liquid Service

BRITISH STANDARDS INSTITUTE (BSI)

BSI 4994	(1987) Design and Construction of Vessels and Tanks in Reinforced Plastics

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION (ISO)

ISO 7005-2	(1988) Metallic Flanges Part 2: Cast Iron Flanges

NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY (NIST)

NIST PS 15	(1975) Custom Contact-Molded Reinforced-Polyester Chemical Resistant Process Equipment

1.2 SUBMITTALS

****

NOTE: Review submittal description (SD) definitions in Section 01330 SUBMITTAL PROCEDURES and edit the following list to reflect only the submittals required for the project. Submittals should be kept to the minimum required for adequate quality control. Include a columnar list of appropriate products and tests beneath each submittal description.

****

The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES in sufficient detail to show full compliance with the specification:

SD-01 Preconstruction Submittals

Existing Conditions shall be submitted by the Contracting Officer.

Material, Equipment, and Fixture Lists and Construction Equipment Lists shall be submitted in accordance with paragraph entitled, "General Requirements," of this section.

SD-02 Shop Drawings

Coordination Drawings shall be submitted in accordance with paragraph entitled, "General Requirements," of this section.

Cleaning
Inspection
Tests

Equipment Room Layout drawings shall be submitted in accordance with paragraph entitled, "Inspection," of this section.

The following shall be submitted in accordance with paragraph entitled, "General Requirements," of this section.

Fabrication Drawings
Installation Drawings
Listing of Product Installation
Construction Equipment Lists
Material, Equipment, and Fixture Lists

SD-03 Product Data

Equipment and Performance Data shall be submitted by the Contracting Officer prior to start.

Equipment Foundation Data shall be submitted for fiberglass-reinforced polyester storage tanks consisting of equipment weight and operating loads, horizontal and vertical

loads, location and projection of anchor bolts, horizontal and vertical clearances for installation, plan dimensions of foundations and relative elevations, and other installation requirements such as utility services.

Manufacturer's catalog data shall be submitted for the following items including spare parts.

Storage Tanks
Accessories

SD-04 Samples

Manufacturer's Standard Color Charts shall be submitted for Laminates.

SD-05 Design Data

Design Analysis and Calculations for fiberglass-reinforced polyester storage tanks shall consist of live and dead loads, wind loads, and equipment and accessory loads affecting tank shells and tops.

SD-06 Test Reports

Test reports shall be submitted for Chemical Resistance Tests in accordance with paragraph entitled, "Chemical Storage Requirements," of this section.

SD-07 Certificates

Listing of Product Installation shall be submitted in accordance with paragraph entitled, "General Requirements," of this section.

Certificates shall be submitted for the following items:

Storage Tanks
Installers

SD-10 Operation and Maintenance Data

The Contractor shall submit [6] [_____] copies of the Operation and Maintenance Manuals 30 calendar days prior to testing the system involved. Data shall be updated and resubmitted for final approval no later than 30 calendar days prior to contract completion.

Storage Tanks
Flanged Nozzles
Inlet Nozzles
Outlet Nozzles

1.3 GENERAL REQUIREMENTS

****

NOTE: If Section 15003 GENERAL MECHANICAL PROVISIONS is not included in the project specification, applicable requirements therefrom should be inserted and the following paragraph deleted.

****

Section 15003 GENERAL MECHANICAL PROVISIONS applies to work specified in this section.

Existing Conditions, including any underground utilities, shall be submitted prior to start.

Fabrication Drawings shall be submitted for fiberglass-reinforced polyester storage tanks.

Installation Drawings for fiberglass-reinforced polyester storage tanks shall include construction and anchorage details. Listing of Product Installation shall be submitted for fiberglass-reinforeced polyester storage tanks identifying at least five units, similar to those proposed for use, that have been in successful service for a minimum of five years. The list shall include purchaser, address of installation, service organization, and date of installation.

Coordination Drawings shall show coordinations of the following processes and with the structural and architectural elements of the work. Drawings shall indicate where conflicts or clearance problems exist between the various functions.

Manufacturer's certification that Storage Tanks are suitable for storage of specified chemicals.

Certificates shall be submitted providing confirmation that Installers have knowledge of the requirements of the applicable standard and that installation practices are enforced to ensure installation in a sound, undamaged condition.

Material, Equipment, and Fixture Lists shall include manufacturer's style or catalog numbers, specification and drawing reference numbers, warranty information, and fabrication site.

Construction Equipment Lists shall consist of proposed construction equipment to be used in the project, including descriptive data.

1.4 PRODUCT DELIVERY AND STORAGE

Tanks shall be handled and stored in a way that will prevent damage. Each tank delivered shall conform to specifications and shall show no indications of damage, surface defects, or poor quality laminate.

All damaged or defective tanks or removable covers will be rejected and

shall be immediately removed from the project site.

PART 2 PRODUCTS

2.1 LOADING CONDITIONS

****

NOTE: Show equipment and accessory loads affecting tank shells and tops, if required. Show windload for exterior tanks and tank top design load when top manways are specified.

****

Tanks shall meet loading conditions specified in project requirements.

2.2 CHEMICAL STORAGE REQUIREMENTS

Design Analysis and Calculations for fiberglass-reinforced polyester storage tanks shall meet loading conditions specified in project requirements.

Test reports shall be submitted for Chemical Resistance Tests in accordance with ASTM C 581. Results of previous successful tests are acceptable provided laminates are representative.

2.3 CAPACITY AND DIMENSIONAL REQUIREMENTS

****

NOTE: Capacities vary from approximately 10 to 75,000 gallons 40 liter to 300 kiloliter.

****

Minimum capacity (gallons) (liter) measured to the top of the straight shell or wall height shall be as indicated.

****

NOTE: Diameters vary from approximately 2 to 16 feet 0.6 to 5 meter.

Wall heights vary from approximately 1 to 47 feet 0.3 to 14 meter.

****

Approximate diameter and approximate straight shell or wall height shall be as specified.

2.4 CONSTRUCTION REQUIREMENTS

****

NOTE: Select either filament-wound or contact-molded construction.

Filament winding is a process for tank fabrication in which continuous strands of fiberglass

impregnated with resin are wound over the inner corrosion barrier in a predetermined geometric pattern.

Contact molding is a process for tank fabrication in which the structural reinforcement comprises sprayed, chopped-fiberglass supplemented with woven-glass roving fabric. This process is also known as hand layup, spray layup, pressure molding, or contact pressure molding. The pressure is seldom greater than that required to hold the materials together during fabrication.

Tanks up to 5 feet 1.5 meter are less expensive when fabricated by contact-molding methods. Strength requirements in larger tanks make filament-wound structures more economical. Filament winding offers equivalent strength with less shell thickness, and laminate quality is also improved.

****

****

NOTE: NIST PS 15 is English system units, for designer information, if needed.

****

[Tank shall be contact-molded, conforming to NIST PS 15 BSI 4994 (NIST PS 15).]

[Tank shall be filament-wound, conforming to NIST PS 15. BSI 4994 (NIST PS 15).]

****

NOTE: Select one of the following for tank top.

****

[Tank shall have an open top, with reinforcing flange or rib [and removable cover.]]

[Tank shall have a closed top.]

****

NOTE: Select one of the following types if tank is to have closed top.

The end of a filament-wound cylindrical container normally appearing convex is called a domed top.

The end of a filament-wound or contact-molded tank normally appearing concave is called a dished top.

****

[Tank shall have a closed top and be type [dome] [dished] [flat].]

****
NOTE: Select one of the following for top fabrication.

Separate fabrication of top and shell is most common.
****

[Closed top shall be [integrally fabricated with shell] [separately fabricated and laminated to the shell].]

****
NOTE: Select one of the following two paragraphs for flat bottom fabrication.

Integral fabrication offers greater strength and does not rely on laminating procedures to join separate sections.
****

The flat bottom shall be fabricated [integrally with the shell] [separately and laminated to the shell].

****
NOTE: Specify any additional special surfaces based on accessories and equipment required.
****

Tank shall have bracketed flat surfaces for [identification plate] [certification plate] [liquid-level gage] [mounting lugs].

Manufacturer's catalog data shall be submitted for Storage Tanks including spare parts.

Manufacturer's Standard Color Charts shall be submitted for visual inspection of surface finish and color of Laminates.

2.5 ACCESSORIES

****
NOTE: Accessories specified are common items for general usage. Consult manufacturer's literature for other standard and special accessories.
****

2.5.1 Flanged Nozzles

****
NOTE: Standard nozzles are suitable for most applications, but conically gusseted nozzles should be specified when vibratory or thermal stresses are anticipated.
****

Nozzles shall be [standard] [conically gusseted].

Flange diameter and drilling shall conform to ASME B16.5, ISO 7005-2, 150 pounds per square inch 1050 kilopascal (150 psi).

2.5.2 Inlet Nozzles

****
NOTE: Double-flanged inlet nozzles should be specified when interior pipe connections are desired.
****

Inlet connections shall be [single] [double] flanged.

2.5.3 Outlet Nozzles

****
NOTE: Double-flanged outlet nozzles should be specified when interior pipe connections are desired.
****

Outlet connections for side shell and top shall be [single] [double] flanged.

Drain shall be [side-bottom] [full] [siphon] [bottom] type.

[Bottom elbow shall be provided.]

2.5.4 Vent

****
NOTE: Select one of the following types of vents for closed-top and removable-top tanks. Show vent size on drawings.
****

Vent for tank top shall be [v-vent] [gooseneck] [mushroom].

2.5.5 Flanged Manways

[Manway not required.]

[Tank shall have [top-flanged] [side-flanged] manway.

Flange diameter and drilling shall conform to ASME B16.5, ISO 7005-2, 150 pounds per square inch 1050 kilopascal.]

2.5.6 Removable Cover

[Cover not required.]

Cover style shall be [domed] [dished] [flat].

[Lifting ring shall be provided at center of cover.]

[Three lifting lugs shall be provided on cover.]

2.5.7 Tiedown Lugs

****

NOTE: Indicate quantity of lugs and angular spacing based on manufacturer's recommendations. Lugs should be specified on tanks subject to vibratory stresses and those erected outdoors. Three to six lugs evenly spaced are standard practice, depending upon tank size.

****

Tiedown lugs shall be provided as indicated.

2.5.8 Tank Lifting Lugs

Three lifting lugs spaced 90 degrees apart shall be provided at top portion of straight shell; one lug shall be provided below center top lug.

2.5.9 Identification Plate

Phenolic-plastic identification plate stating chemical to be stored shall be provided, with letters at least 2 inches 50 millimeter high.

2.5.10 Certification Plate

Stainless-steel certification plate shall be provided, stating chemical to be stored, concentration, specific gravity, and maximum temperature.

PART 3 EXECUTION

3.1 INSTALLATION

Tank shall be installed on foundation in accordance with recommended manufacturer's instructions. Equipment Foundation Data shall be submitted by the Contracting Officer.

3.2 HYDROSTATIC TEST

After tank has been installed, before piping connections are made and equipment attached, outlets shall be blocked and straight-shell portion shall be filled with chemically compatible fluid. Hydrostatic Tests shall be made to determine if leakproof storage is provided, and deficiencies shall be corrected. Unsatisfactory tanks shall be repaired or replaced and retested at no additional cost to the Government until leakproof systems are obtained.

3.3 CLEANING

After installation has been completed and piping connections have been made, tank and nozzles shall be cleaned in accordance with manufacturer's instructions.

3.4 INSPECTION

Installed tanks shall be inspected for indications of defective workmanship or improper installation practices. Faulty construction and damaged work shall be repaired or replaced at no additional cost to the Government.

Equipment and Performance Data shall be submitted by the storage tank manufacturer indicating use life, safety features, and mechanical automated details.

Equipment Room Layout drawings shall show structural and fenestration features, and items requiring installation that could reduce the available space. Ductwork and piping shall also be detailed.

-- End of Section --